Hindawi Publishing Corporation
Epidemiology Research International
Volume 2015, Article ID 630812, 5 pages
http://dx.doi.org/10.1155/2015/630812

Research Article

Distribution of Human Leishmaniasis (VL) and Its Associated Risk Factors, in Metemma, Ethiopia

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Received 11 August 2014; Revised 20 January 2015; Accepted 20 January 2015

Academic Editor: Tongzhang Zheng

Background. Leishmaniasis is a parasitic disease caused by obligate intracellular protozoans of the genus *Leishmania*. *Objective*. To assess the distribution of human leishmaniasis and assess community knowledge, attitude, and practice with regard to assumed risk factors and control options used by the society. *Methods*. Retrospective study from November 2013 to May 2014 was used. Six-year data from Metemma hospital record was reviewed and 89 people were interviewed. *Results*. The rates were 29% (n = 374/1270) and 26% (n = 328/1270) in 2005 E.C and 2003 E.C, respectively. 94% (1194/1270) of the affected individuals were in the age exceeding 15 years. At the same time, the rates in males and female were 97% (n = 1226/1270) and 3% (n = 44/1270), respectively. According to 88.8% (n = 79/89) of the respondents, transmission occurs through bite of sandflies, while 98.9% (n = 88/89) of the respondent's indicated that waste disposal in an open space was one of the risk factors for disease occurrence. Regarding the control measures, respondents replied that 73% (n = 65/89) of them use impregnated bed net and others use cleaning and proper waste disposal. *Conclusion*. The current finding indicated that the disease was common in the study area; as a result, proper use of impregnated bed net, early diagnosis and treatment, and reduction of different risk factors were essential.

1. Background

Leishmaniasis is a parasitic disease caused by obligate intracellular protozoans of the genus Leishmania. The most common species of *leishmania* are *Leishmania donovani* and *L. infantum* or *L. chagasi*. The parasite is transmitted to humans and animals through the bite of an infected female phlebotomine sandfly. The parasites can also be transmitted directly from person to person through sharing of infected needles from infected individuals. The most common forms of the disease in humans are visceral leishmaniasis (Kala azar), which is caused by species of *L. donovani* complex that consists of mainly *L. infantum*, *L. donovani*, and *L. chagasi* which are nearly always fatal if left untreated. The clinical syndrome is characterized by fever, weight loss, splenomegaly, lymphadenopathy, and hepatomegaly. Dogs are considered the major reservoir for many species of VL for human. Visceral leishmaniasis is one of the world's most neglected diseases, largely affecting the poorest people, mainly in developing countries [1, 2].

Human and animal visceral leishmaniasis is widely distributed worldwide, namely, intertropical zones of America, Africa, and temperate regions of South America, Southern Europe and Asia. Epidemics of visceral leishmaniasis, in both the old and the new world, are often associated with migration and the introduction of nonimmune people into areas with existing endemic or enzootic transmission cycles. Seasonal labor movements may also spread the disease, with the return of migrants to nonendemic areas and living in houses constructed of grassy material, appears to increase risk for the disease [3].

The focal distribution of leishmaniasis transmission sites depend on microecological conditions that affect the population of vectors, the parasite, and the reservoir host. Environmental changes that can affect the incidence of visceral leishmaniasis include urbanization, domestication of

the transmission cycle, and the incursion of agricultural farms and settlements into forested areas. The parasite distribution is mainly affected by rainfall, atmospheric temperature, and humidity (climate-sensitive disease). Global warming and land degradation together are expected to affect the epidemiology of leishmaniasis by a number of mechanisms [4].

The diagnosis of VL is complex because its clinical features are shared by a host of other commonly occurring diseases, such as malaria, typhoid, and tuberculosis. Laboratory diagnosis of leishmaniasis can be made using *in vitro* culture or animal inoculation and detection of parasite DNA in tissue samples or immune diagnosis by detection of parasite antigen in tissue, blood, or urine samples.

For many years, pentavalent antimonials have been the recommended drug for VL. Pentavalent antimonials, meglumine antimoniate (Glucantime, Sanofi-Aventis), and sodium stibogluconate (Pentostan, GlaxoSmithKline) have variable efficacies against VL and require injectable administration, that can be intravenous (IV), intramuscular (IM), or intralymphatic (IL). Due to side effects such as high cardiotoxicity, pancreatitis, and nephrotoxicity, patients should be hospitalized and monitored, as treatment may need to be suspended [5, 6]. Antimonials seem to have a broad mechanism of action [7].

Amphotericin B deoxycholate (Fungizone) is a systemic antifungal and a highly active antileishmanial. Due to the increasing resistance to antimonials, it is used as an alternative drug for VL. But it is highly toxic, requiring careful and slow IV administration. A combination therapy of miltefosine with amphotericin B or paromomycin is very efficient and could be helpful to treat antimony-resistant VL infections. Sitamaquine is the second oral drug in the development of leishmaniasis treatment [8].

The Ministry of health of Ethiopia estimated that the annual burden of VL ranges between 4,500 and 5,000 cases. But, with regard to cutaneous leishmaniasis, there is no reliable data. But it has been estimated that the number of CL cases significantly exceeds that of VL. Several studies have definitively demonstrated that VL occurs in Northwestern Ethiopia (Humera and Metemma). Since the epidemic of disease is chracterized by high mortality in adults, high disease incidence was observed in age 15–45 groups. The Northwestern VL focus in Ethiopia covers the Semiarid Metemma and Humera plains in Tigray and Amhara regional states bordering Sudan [9].

The disease in the northwestern part of the infected areas was associated with HIV coinfection where 30% of VL patients have HIV [10].

In the study area, there were limited studies conducted to assess the rate of the disease but there was no study conducted to assess the disease status using existing data of the hospital and risk factors associated with indigenous knowledge of the society who were living around the area. In addition, there were so many reports of visceral leishmaniasis in the study site and this study was designed with objective of determining visceral leishmaniasis distribution and assessing the knowledge off the community on the assumed risk factor.

2. Methods

2.1. Study Area. The study was conducted from November 2013 to May 2014 in Metemma Wereda, Amhara regional State which is located about 928 km North West of Addis-Ababa and 188 km west of Gondar town. Total population of the study area is 110,252 [11]. The area is bordering with Sudan (West) and other Weredas of Quara (South West), Chilga (Eastern), Alefa (South East), and Tach Armachiho (North). In the Wereda there are 20 peasant associations of which 18 were rural based peasant administration areas. The altitude of the study area ranges from 500 to 1,608 meters above sea level. Minimum annual temperature falls from 22 to 28°C and the maximum temperature reached as high as 43°C. The mean annual rain fall ranges from 850 to 1110 mm [12].

2.2. Study Design. Retrospective study using six-year data to assess the disease distribution in Metemma hospital and desk review from the documentation of the hospital was used. Furthermore, structured questionnaire survey to assess the perception of the community on different assumed risk factors and control measures of the disease was designed and administered to 89 respondents.

2.3. Study Participants. The source populations for the interviewee were randomly selected residents of Genda Wuha town from Kebeles 01, 02, Kokit and Shenfa of the Wereda.

2.4. Data Collection. Documents of the hospital to look at the recorded diseased individuals in different years starting from 2000–2006 E.C were used. In addition, face to face interview was conducted. The data was then recorded in an excel spread sheet.

2.5. Data Analysis. All the collected data were entered into Microsoft Excel spread sheet and coded appropriately. The coded data was transferred in to SPSS sheet version 20. For the statistical analysis, descriptive statistics was used to determine the proportion of respondents to the different assumed risk factors and control options of the disease.

3. Results

The result showed that the distribution of the disease was higher in 2005 followed by 2003 compared with other years (Figure 1).

Regarding sex category, the highest distribution was observed in males in contrast with females (Figure 2).

Visceral leishmaniasis distribution among different age groups indicated that adult age group (>15 years) were more affected than other age groups (Figure 3).

With regard to indigenous knowledge of the people on VL, all the 89 respondents clearly indicated that they know the disease and named it with different local names (Table 1). They also clearly stated that the disease has economic importance.

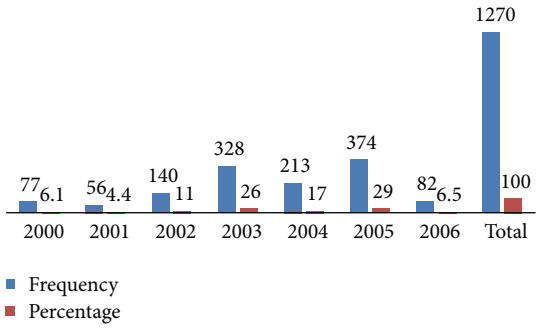

Figure 1: Distribution of VL in six consecutive years.

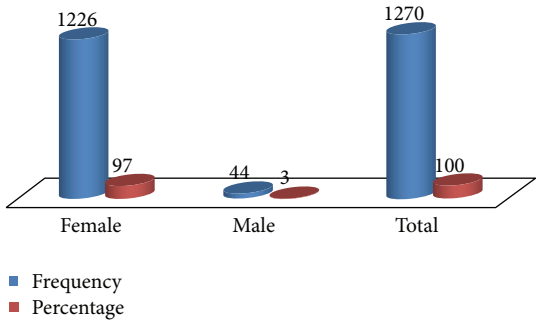

Figure 2: Sexwise distribution of VL.

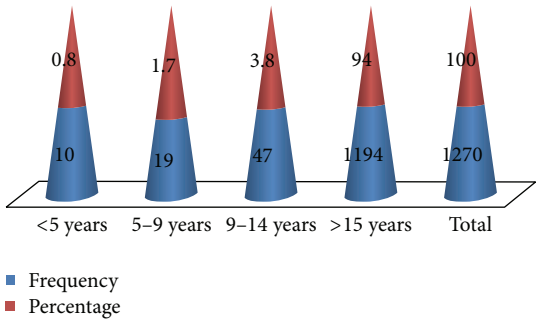

Figure 3: Distribution of VL in different age groups.

Table 1: Knowledge status of local people on VL and its economic importance.

Variables		Frequency	Percentage (%)
Knowledge of the disease	Know	89	100
	Do not know	0	0
Local name	Kala azar	75	84.3
	Laba	10	11.2
Economic importance	Time loss	3	3.4
	Family disturbance	4	4.5
	Time and budget	82	92.1

Distribution of the respondents regarding sex, age category, educational status, and source of income during the interval was indicated in Table 2.

Table 2: Sex, age, educational status, and income source of respondents.

Variables		Frequency	Percentage (%)
Sex	Male	77	86.5
	Female	12	13.5
Age category	15–25	15	16.9
	26–36	30	33.7
	37–47	35	39.3
	>48	9	10.1
Educational status	Illiterate	55	61.8
	Basic education	1	1.1
	Primary school	18	20.2
	Secondary school	4	4.5
	College	11	12.4
Source of income	Agriculture	70	78.7
	Trade	7	7.9
	Civil servant	12	13.4

Bed net and environmental cleaning were found to be commonly used as means of protecting from black flies bite by majority of the respondents (73%). However, 98.9% of the respondents also indicated that waste was disposed openly which might be one of the factors for attracting the sandflies. And the disease was common in summer and autumn according to 52.8% of the respondents and transmission of the disease occurred due to sandfly according to 88.8% of interviewed as stated in Table 3.

4. Discussion

In the current finding the proportion of affected population by visceral leishmaniasis in six consecutive years revealed that the highest proportion was recorded during 2005 E.C having the rate of 29% followed by 2003 E.C with the prevalence of 26%. This result was lower compared to the study conducted by [13] who reported prevalence of 36% but was higher compared to 11–13% [14].

Age wise distribution of human leishmaniasis in the study site indicated that it is more common in populations with age of 15 years and above with the rate of 94% similar to [9] who indicated that these adult human beings older than 15 years were more affected compared to the lower age groups. At the same time, [15] indicated that 3.3% children younger than 5 years, 19.2% of children 5–14 years, and 8.6% of adults 40 years or older were affected.

Sex distribution of the different years also revealed that males were highly affected compared to females with the rate of 97% and 3%, respectively. This might be due to exposure of the males to different agricultural areas whereby the flies can easily multiply and bite these individuals. Furthermore, due to the high trafficking of males for agricultural activities, males are more vulnerable than females [16].

The response from different respondents indicated that disease transmission occurred due to the bite of sandflies evidenced by 88.8% of the respondents. This transmission was exacerbated when wastes were disposed in an open space

Table 3: The common risk factors used to assessment of VL distribution.

Variable		Frequency	Percentage (%)
Use of bed net	Used bed net	65	73
	Did not use bed net	24	27
Presence of gorge around house	With gorge	68	76.4
	Without gorge	21	23.6
Types of waste disposal	Open	88	98.9
	Closed	1	1.1
Presence of hyrax	Present	2	2.2
	Absent	87	97.8
Common age group	Adult	81	91.0
	Children and adult	5	5.6
	Old and adult	3	3.4
Common seasons	Summer	11	12.4
	Winter	3	3.4
	Spring	13	14.6
	Autumn	2	2.2
	Summer and autumn	47	52.8
	Winter and spring	13	14.6
Transmission	Sandfly	79	88.8
	Mosquito	10	11.2
Control methods	Using bed net	20	22.5
	Cleaning the surrounding	4	4.5
	Using bed net and cleaning	65	73.0

in the environment according to the information from 98.9% of the respondents which was in line with [9] who clearly indicated nocturnal outdoor exposure was also seen in their earlier study in Libo KemKem. In addition, the presence of gorge around houses could be responsible for resting of sandflies being one of the important risk factors for the disease transmission and is in line with [17] who stated sandfly as predominantly outside feeder or in thatch-walled houses that are highly vulnerable to sandfly entry and resting. Seasonal distribution of the disease also revealed that it was common in summer and autumn according to 52.8% of the respondents.

With regard to the control options of the disease, most respondents agreed that using impregnated bed net was very crucial for protection of the disease evidenced by 73% of the interviewees. In agreement with the current finding the massive scale-up of insecticide-treated nets for malaria control may, therefore, have collateral benefits for VL control [18].

Moreover, cleaning the surroundings areas and using impregnated bed net at the same time played significant role in the reduction of the disease prevalence as responded by 73%. At the same time, using impregnated bed net was one of the most important means of control of the disease according to the report of [19] who indicated that 72% of respondents in his study explained that using bed net was the most important means of control of the disease. In addition, [15] also stated strong protective effects observation in those people using bed net.

WHO also stated that the most important risk factors contributing to high prevalence of the disease are environmental and host risk factors which include sex, season, age, and source of income (day to day activity of the respondents). The environmental condition surrounding the house such as gorge, the presence of reservoir host, and types of waste disposal related with indigenous knowledge of the people [3].

5. Conclusion

The result of the current finding indicates that the disease is endemic in the study area even though the numbers of patients in the six consecutive years were varying. In addition, the disease was common in males and adults. Most of the disease transmission was through the bite of sandflies. The most important risk factors contributing for the disease occurrence in the area were the presence of sandflies (responsible vector for VL transmission) and gorges around their surrounding area and waste disposal around open space. Use of impregnated bed net and cleaning the surrounding areas were some of the important practices commonly used by the society as control strategies.

Based on the current finding the following points were recommended.

(i) The existing usage of impregnated bed net should be expanded.

(ii) Continuous surveillance of the disease is very essential.

(iii) Early diagnosis and treatment of infected individual was very essential.

(iv) Further study to assess the exact magnitude of the disease should be conducted.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Authors' Contribution

Yibeltal Terefe and Dr. Berihun Afera initiated the proposal and Yibeltal collected data for the paper and Dr. Berihun Afera was a major contributor starting from designing of the paper to following-up during data collection and analyzing the data. But the other authors were involved in paper editing. Yibeltal Terefe and Dr. Berihun Afera contributed to the writing of the paper and all authors approved submitted version of the paper.

Acknowledgments

The authors would like to acknowledge Mekelle University College of Veterinary Medicine for the overall support during the research. At the same time the authors would like to extend their acknowledgement for Gondar University staff that cooperated in data collection. Finally, the authors would like to extend their thanks for the respondents who devote their time during the interview.

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